Supporting Information

Biomass-Based Shape-Stabilized Composite Phase-Change Materials with High Solar–Thermal Conversion Efficiency for Thermal Energy Storage

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Figures

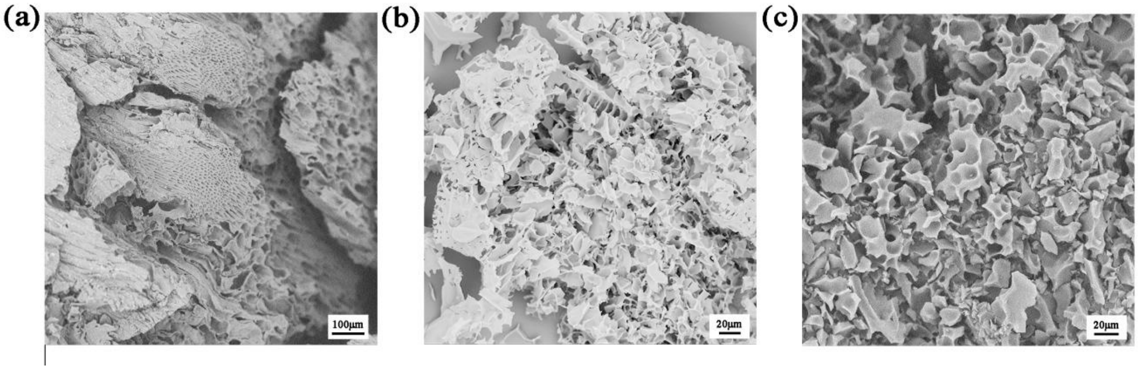

Figure S1. SEM images of PCC-800 (a), PCC-1-800 (b), PCC-4-800 (c).

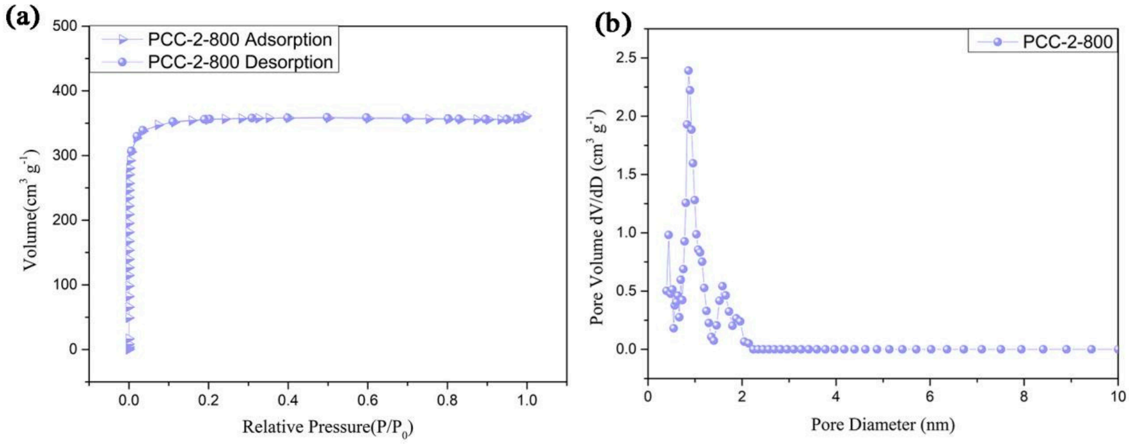

Figure S2. (a) Nitrogen adsorption/desorption isotherms and (b) DFT desorption pore size distribution of PCC-2-800.

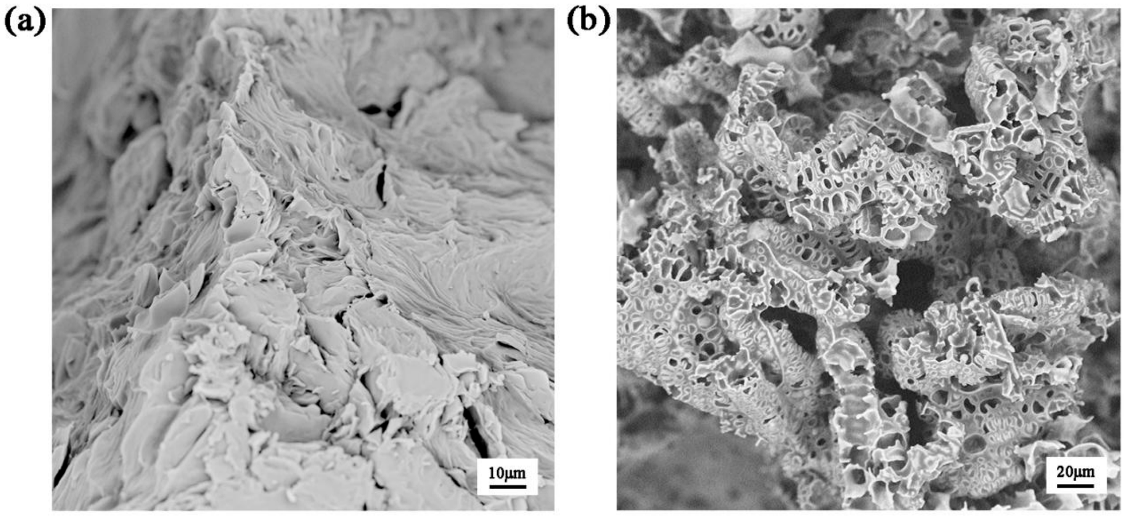

Figure S3. SEM images of composite PCMs: (a) PEG/PCC, and (b) OD/PCC.

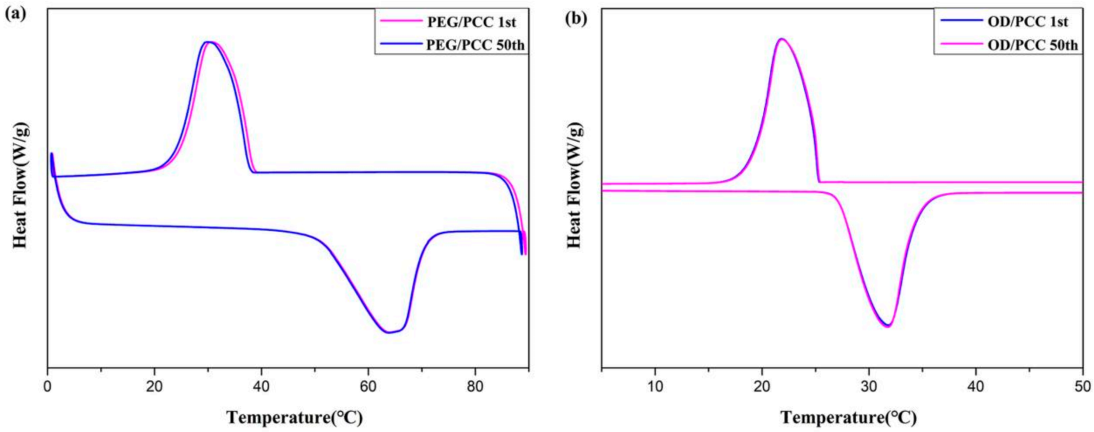

Figure S4. DSC curves of composite PCMs after thermal cycles: (a) PEG/PCC, and (b) OD/PCC.

Table

Table S1 BET surface area and pore volume of coniferous plants.

Samples	BET surface area (m^2/g)	Total pore volume (cm^3/g)	Pore size (nm)	Ref.
Cedarwood bark-derived carbon (CBC800)	441	0.226	1-3	[1]
Pine tannin-derived carbon (TW)	652	0.65	2-30	[2]
Pine tannin-derived carbon (TW-EA)	485	0.58	2-30	[2]
Pine tannin-derived carbon (TNa-A)	446	0.23	0.6-10	[2]
Pine tree seed carbon (PTAC13)	929.9	-	0.5-30	[3]
Carbonized pine	687.96	0.37	1.1-3	[4]
Dead pine needles-derived carbon (PN-1000)	783	0.49	2.55	[5]
PCC-2-800	1405.4	0.55	1.58	This work
PCC-3-700	862.04	0.42	1.93	This work
PCC-3-800	1758.60	1.21	2.74	This work
PCC-3-900	679.73	0.38	2.26	This work

Table S2. Thermogravimetric data of PCC.

Samples	$T_{5\%}$ (°C)	T_1 (°C)	T_2 (°C)	Mass at 800°C (%)
PCC-3-700	285	152	412	85.2
PCC-3-800	559	185	460	90.9
PCC-3-900	431	164	465	92.4

Table S3. Thermal transition capacity and the loading of recently reported composite PCMs.

Supporting materials	PCMs	Latent heat (J/g)	Loading (wt%)	η (%)	Ref.
Pinecone biochar	Palmitic acid	84.7	38.6	-	[6]
Pinus resinosa biochar	Dodecanoic acid	50.87	32.53	-	[7]
Softwood biochar	Eicosane	53.4	26.4	-	[8]
Wheat straw biochar	Eicosane	75	37.1	-	[8]
Potato derived carbon	PEG4000	91.8	50.0	-	[9]
PCC-3-800	PEG4000	144.26	91.41	79.9	This work
PCC-3-800	Octadecane	162.25	83.44	84.8	This work

Table S4. Thermogravimetric data of PEG, OD, PEG/PCC and OD/PCC.

Samples	$T_{5\%}$ (°C)	Tmax (°C)	Mass at 800°C (%)
PEG	372	427	0
OD	141	229	0
PEG/PCC	352	435	5.1
OD/PCC	142	476	22.7

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